EXPERIMENT ENVIRONMENT

Vibration and G Forces

The primary effects that the Shuttle launch and landing environment will have on SEM experiments are the accelerations and vibrations that effect structural integrity. Maximum accelerations and random vibrations induced on SEM experiments have been calculated based on analyses and tests of actual flight data of other experiments flown in GAS canisters. The vibration loads which envelope the worst case Shuttle induced loads are shown in figure XX. Experiments sensitive to vibration should consider vibration testing of the experiment to increase confidence in the design. Experiments should be designed to withstand stresses induced from G loads of (11.0 x 32.2) ft/second squared, simultaneously applied in three directions orthogonal to the Space Shuttle Coordinate System.(Additional Information to be supplied).

Thermal Environment

SEM payloads will be flown in GAS canisters with insulation on all exterior surfaces. At launch, payloads are normally at a temperature of 65 - 70 degrees F (18 -21 degrees C). During flight the payload temperature gradually changes depending on the orientation of the Shuttle with respect to the ground and sun. Usually temperatures fall during the flight, sometimes to below zero degrees (Fahrenheit). NASA thermal engineers have predicted that the worst temperature extremes within the SEM module will be temperatures between -20 and +60 degrees Centigrade. Experiments should be designed to survive these temperature extremes.

Atmosphere

The SEM Carrier System utilizes a *standard, sealed, 5 cubic foot* Gas Canister Assembly, internally pressurized and sealed to one (1) atmosphere with dry nitrogen before launch. The GAS canister is designed to maintain this internal environment throughout the Shuttle Mission. This is the environment that experiments will be exposed to during spaceflight.

As part of the required pre-spaceflight testing of each SEM Payload, the SEM Carrier System will be subjected to an additional 3 psi of pressure above normal ambient pressure of 14.6 psi. Experiments should be designed to withstand an external pressure load of +3 psi above normal atmospheric pressure.

SAFETY CONSIDERATIONS

The GAS canister will contain a dry nitrogen atmosphere at approximately one atmosphere absolute pressure. The actual pressure will vary with temperature approximately plus or minus 10 percent or 1.5 PSI. Each module is nominally sealed but not considered gas tight.

All experiments flown in SEMs must meet Shuttle safety requirements.

- The experimenter must supply a list of all components and materials used in construction of the experiment as part of the Experiment Data File.

- Highly toxic, flammable, corrosive, or explosive materials may not be used.

- Batteries may not be used.

- No radio transmitters or radioactive material may be used.

- Experiments involving high voltage (over 30V) will need to be approved on a case by case basis. No intentional arcing or plasma discharge is allowed.

- All experiments will be inspected by NASA prior to installation into modules.

- Experimenters must provide their own sealed containers for containing fluids or controlled atmosphere which must be able to withstand the expected pressure and temperature conditions without leaking.
  1. Experiments involving fluids and more than one container must be leak tested at a pressure at least 50 percent higher than the expected pressure.
  2. Any sealed containers, pipes, etc. must be made of plastic or other soft material (not metal) to prevent an explosion hazard in event of fluid freezing.

- Containers or vessels pressurized at pressure higher than nominally one atmosphere (15 PSI absolute) are not allowed.

The module has a pressure relief system (rubber blowout disk) which will vent the module to the interior of the GAS can in event of accidental over pressure in a module. The GAS can has pressure relief valves which will vent the GAS can to space in event of general overpressure condition in the can. Venting of the GAS can is not allowed except for emergency because of the possibility of contaminating other equipment.

The Project will develop and maintain a list of acceptable materials and components in the data base.